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ABSTRACT

Proceedings of the Conference on Issues in Minority Science Education are presented. An overview of Atlanta University's Resource Center for Science and Engineering, which sponsored the conference, and a rationale for the conference are provided. Seven panel discussion reports are given, including such topics as curriculum and faculty development, the role of research, and the relationship of federal agencies to black colleges and universities. A presentation of the "Community Outreach Component" and an address by Herman R. Branson, "Knowing Comes First," on the status of black higher education, follow. Group sessions focused on the major programs of biology, chemistry, mathematics and computer science, and physics and engineering with emphasis on the problems and concerns in these majors and strategies and approaches for remedying the problems. Other group sessions used the same problem/concern--strategy/approach to topics in areas of academic management, recruitment and retention, and resources and funding, among others. Following the concluding remarks, a roster of participants is provided. An evaluation of the conference is appended with composite responses, along with data on racial/ethnic enrollments in 1976. (PHR)

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PROCEEDINGS

March 15-17, 1979

AT ATLANTA UNIVERSITY

Atlanta, Georgia

U S DEPARTMENT OF HEALTH
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

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RESOURCE CENTER FOR SCIENCE & ENGINEERING

RESOURCE CENTER FOR SCIENCE AND ENGINEERING

AT

ATLANTA UNIVERSITY

P R O C E E D I N G S

CONFERENCE ON ISSUES IN MINORITY SCIENCE EDUCATION

MARCH 15-17, 1979

PASCHAL'S MOTOR HOTEL
ATLANTA, GEORGIA

TABLE OF CONTENTS

	Page
PREFACE	ii
THE RESOURCE CENTER FOR SCIENCE AND ENGINEERING	iv
RATIONALE FOR THE CONFERENCE	1
PANEL DISCUSSION	5
Enrollments and Degrees (RCSE Report #1)	
Curriculum and Faculty Development	8
Recruitment and Retention	12
Careers	15
The Role of Research	17
Resources and Funding	20
Federal Agencies and the Black Colleges and Universities (RCSE Report #2)	
THE COMMUNITY OUTREACH COMPONENT - The Saturday Science Academy	22
ADDRESS: "KNOWING COMES FIRST"	25
DISCIPLINE GROUP SESSIONS	39
"Programs for Majors"	
Biology	39
Chemistry	45
Mathematics and Computer Science	49
Physics and Engineering	55
STRATEGY GROUP SESSIONS	59
Interdisciplinary and Cognate Courses	59
Academic Management	61
Recruitment and Retention	62
Careers	68
Research	71
Resources and Funding	75
CONCLUDING REMARKS	79
ROSTER OF PARTICIPANTS	81
APPENDIX	88

PREFACE

Accompanying the Proceedings are two papers which were not presented during the Conference. These papers are not included in the Proceedings of the Conference, but are being made available to you as RCSE Reports Nos. 1 and 2:

"Degrees, Enrollment and Field Preference for Black Students in Science and Engineering Fields: Recent Data"	Dr. Frank Cummings Associate Professor and Acting Chair Department of Chemistry Atlanta University
"Federal Agencies and the Black Colleges and Universities"	Dr. John T. Hayes Chair, Division of Natural Sciences and Mathematics Paine College

Subsequently the Resource Center for Science and Engineering will publish and disseminate RCSE Reports on additional issues, as well as technical materials related to science education in minority institutions. These Reports will not be printed on a regularly scheduled basis, but will be selected for dissemination on the basis of timeliness and/or scientific merit, when the Resource Center for Science and Engineering is in a position to make funds available.

In the process of planning this Conference, the state representatives of the Regional Institutions Component and the Executive Committee and staff of the Resource Center for Science and Engineering sought to provide a means of increasing communications and interchanges among all concerned. Hence, the format was designed to provide an abundance of opportunities for such interchanges during the Conference. We hope there will be subsequent interchanges among the participants. We hope, therefore, that these Proceedings will prove beneficial to you by providing suggestions, recommendations, approaches and alternatives which might be used to enhance the various programs at your respective institutions.

We wish to thank all the participants for their support and contributions, and we hope that they will have gained as much from the experience as was gained by the staff of the Resource Center. You have helped us tremendously by placing the issues addressed in their proper perspective. This, in turn, will enable the Resource Center to provide assistance, both regionally and nationally, in the facilitation and implementation of programs of studies in the sciences.

Paul L. Brown
Assistant Director for
Regional Institutions Component
Resource Center for Science and
Engineering

Some of the materials incorporated in this Work were developed with the financial support of the National Science Foundation Grant #78-11955. However, any opinions, findings, conclusions, or recommendations expressed herein are those of the authors and do not necessarily reflect the views of the Foundation or the Resource Center for Science and Engineering at Atlanta University.

INFORMATION ON THE RESOURCE CENTER FOR

SCIENCE AND ENGINEERING

The Resource Center for Science and Engineering (RCSE) is designed to increase the number of scientists and engineers from minority and low-income groups. Under the auspices of this project, Atlanta University and the four undergraduate colleges in the Atlanta University Center (Clark, Morehouse, Morris Brown and Spelman) are intensifying efforts to make their scientific resources more available to the Atlanta community and to a network of predominantly black colleges and universities in the Southeast. The project is implemented through three functional parts--Regional Institutions, Community Outreach, and Atlanta University Center Components.

Regional Institutions Component

This component sponsors various activities aimed at enhancing science instruction and research at thirty-nine historically black institutions. A series of tuition-free Short Courses are offered annually to regional institution faculty, a ten-week Summer Enrichment Program is conducted annually for forty students from colleges in the region, and Consulting Scientists, drawn from local and national sources, have been identified to visit institutions to provide counsel, advice, and information on the strengthening of science programs and proposal development. In an effort to enhance Research Opportunities at the regional colleges, this component has increased the availability of research resources in the Atlanta University Center and other locations throughout the country to faculty and students from the region. In conjunction with the Research Opportunities Program, the Resource Center has effected an arrangement with the CHEMS Program, funded by the NSF at the Georgia Institute of Technology, to defray the costs of repairs on equipment and instruments at the regional institutions. The Resource Center will sponsor a second conference on Issues in Minority Science Education in 1981.

Community Outreach Component

Activities subsumed under this element are projected to increase accessibility to scientific resources for lay persons and public officials, to increase awareness of science career options among parents, students, and counselors, and to encourage talented minority and low-income youth to consider careers in science, mathematics and engineering. Specific

activities include a Saturday Science Academy for elementary school children, a Summer Science and Mathematics Institute for high school youth, Annual Workshops for high school counselors, Increment-Credit Courses for teachers, and an Atlanta University Center Open House. Initial activities have focused upon the metropolitan Atlanta area. Successful elements will be exported to the participating regional institutions as funding and interest permit.

Atlanta University Center Component

This component focuses upon expansion in several academic areas including biology, chemistry, mathematics, computer science, and physics in the Atlanta University Center. Emphasis is placed upon strengthening graduate programs at Atlanta University, as well as expanding options for participation of Atlanta University Center students and faculty in a variety of activities including collaborative arrangements with the University of Georgia and the Georgia Institute of Technology. An undergraduate engineering laboratory will be established to strengthen the Dual Degree Engineering Program. New graduate programs being implemented include an M.S. degree program in physics, M.S. emphasis in computer science, and Ph.D. program in chemistry.

The Resource Center is funded under a four-year grant from the National Science Foundation. Dr. Thomas W. Cole, Jr. is the Project Director; Dr. Paul L. Brown, Assistant Director for the Regional Institutions Component; and Dr. Melvin R. Webb, Assistant Director for the Community Outreach Component. Ms. Claudia H. Huff serves as Communications Coordinator, Ms. Gwendolyn M. Sapp is the Administrative Assistant, and Ms. Marilyn R. Marshall is Secretary.

RATIONALE FOR THE CONFERENCE

Thomas W. Cole Jr.,
Project Director
Resource Center for Science and Engineering

I have been asked to present the rationale for this conference on "Issues in Minority Science Education." As the name implies, the conference will focus on issues identified by the Resource Center staff in consultation with colleagues in the Atlanta University Center (Clark, Morehouse, Morris Brown and Spelman Colleges) and the Regional Advisory Council as broad topical areas for discussion during the next two days.

In part, the conference is a follow-up to an earlier one held in October 1977, when representatives from thirty-four colleges in Georgia, North and South Carolina, Alabama, and Florida convened in Atlanta to help shape a Regional Resource Center model that would be responsive to the educational needs in science and engineering for the historically black institutions in the region. This conference is the first of two conferences to be sponsored by the Resource Center and planned for years one and four of the grant period; they will be implemented under the Regional Institutions Component.

The issues which will be discussed during this conference are not exhaustive. Basically, they represent one perspective of the problem of the underrepresentation

of minorities in the science and engineering fields: that of the faculty at the historically black institutions. Since these institutions have produced the majority of blacks with doctoral degrees in science and engineering, it is appropriate that perspectives drawn from the experiences at these institutions serve as the focal point for the first conference. The format for the second conference scheduled for the spring of 1982 has not been finalized; the discussions and suggestions recorded during the next two days, therefore, will help to set the tone for subsequent conferences and forums.

At a time when the white academic community is crying "reverse discrimination" in higher education; when there is a clear direction away from a commitment to minorities, particularly at the graduate level at many elitist institutions; when HEW guidelines, coupled with an insensitive and misinformed State Board of Regents, are threatening the existence of black public institutions in Georgia and other Southern states; when growing numbers of blacks in major urban centers are relegated to community colleges rather than four-year institutions; and when a skeptical Congress cannot recognize the importance of funding a third Resource Center at a budget of $3 million (which would be most inadequate), it is imperative that we take time now, when the availability of minority-focused programs of the federal government (such as MISIP and RCSE) makes it possible to convene, to address

seriously the issues of minority science participation.

It is to be hoped that during the next two days you will devote your best thinking to the areas already identified and others you may choose to introduce, so that when the conference is adjourned there will be a coherent, consensus hard-copy report from each of the discipline and session groups that will serve as the basis for a Summary Proceedings of this Conference. It is most important, therefore, that the discussions be kept on target and that the moderators and recorders guide the discussions, in order that specific strategies and approaches emerge for future discussion. Time has been reserved on the program for the finalization of all reports.

It is incumbent upon those of us with concern about equal access to higher education and the shortage of minority manpower in the national workforce that we help to shape policy decisions for the administrators at our own institutions and for the decision-making bodies external to the academic environment which will have an impact upon minority participation in science and engineering. Hopefully, all participants will feel free to share their experiences on curricular matters, recruitment and retention, academic management, research and financial resources, and help produce a set of strategies and approaches, priorities and problem areas that will bring to fruition short- and long-term goals for your own institutions and the scientific community-at-large, and suggest ways in which the

Resource Center in Atlanta may be of assistance in attaining these goals.

Originally, this was termed a "national conference"; although the issues are of national concern, the participation is largely regional. With more time for planning and greater financial resources, it is hoped that the next conference will be national in scope in every sense.

We are delighted to see so many of you take time from busy schedules to come to Atlanta and, in some cases, at considerable sacrifice, and we look forward to the next two days of discussion on "Issues in Minority Science Education."

PANEL DISCUSSION

"The Broader Issues Related to Science Education in Minority Institutions"

Background Paper:

"Degrees and Enrollments: Recent Data" RCSE Report #1

Frank Cummings
Associate Professor and Acting Chair
Department of Chemistry
Atlanta University

"Curriculum and Faculty Development"

James H. M. Henderson
Senior Research Professor of Biology and
Division Chair
Division of Natural Sciences
Tuskegee Institute

Since the founding of Cheyney State College in 1837 in Pennsylvania, followed closely by Lincoln, Pennsylvania in 1854, and Wilberforce in Ohio in 1856, the struggle for equality of blacks in higher education and equality of achievement in the vocational, professional and free enterprise pursuits of this country has been a goal uppermost in the minds and plans of black people.

At the beginning of the twentieth century, less than 1,000 blacks were enrolled in colleges in this country, compared to 300,000 for whites (a 1:300 ratio). By 1920, the number of blacks had increased almost tenfold. By 1950, enrolment for blacks had reached nearly 100,000, of which approximately two thirds were in black colleges.

By 1975, the number of blacks in colleges in the United States had reached the one-million mark (7 percent of the total college enrollment) but of these, approximately 800,000 were enrolled in white (majority) schools.

In the Southeast (the fourteen SREB states) in 1976, the number of blacks enrolled was 426,000, of which 183,000 (43 percent) were in predominantly black institutions, and 243,000 (57 percent) were in predominantly white institutions. From these institutions in the Southeast a total of 251,548 (27 percent of the national total) Bachelor's degrees were awarded; 79,101 (25 percent of the national total) Master's degrees were awarded; and 7,491 (22 percent of the national total) doctoral degrees were awarded. Of these degrees, 11.5 percent, 11.3 percent and 4.3 percent, respectively, were awarded to blacks. Note that there is a drastic decrease at the doctoral level of achievement.

Of the almost 30,000 Bachelor's degrees awarded to blacks, the largest number is in the fields of Education, Business, and Social Sciences (66 percent). In the sciences, Biology had the largest percentage (4 percent). Physical Sciences and Mathematics were 1.1 percent and 1.7 percent, respectively.

At the Master's level, Education accounted for over 75 percent (6,703) for blacks; the Natural Sciences accounted for 2.3 percent. At the doctoral level, the comparable figures were Education 75 percent (239) and the Natural Sciences 6 percent (19).

Clearly, then, the greatest need for blacks in curriculum is in the Natural Sciences and Engineering. In 1975-76, 55 percent and 61 percent of all doctoral and Master's degrees were awarded to blacks in the field of Education. Less than 20 percent was in the areas of Engineering, Health Professions, and Computer Science. On the other hand, blacks seem to have concentrated in Biology and Mathematics, rather than in the applied areas of these two fields.

The need, therefore, is for more exposure and availability of courses and curricula in the hard sciences and their applied areas.

"Academic Management"

Herman R. Branson
President
Lincoln University, Pennsylvania

Now that you have heard the distressing figures of the number of blacks in certain fields, it is obvious that we must do something about the situation. There is no question about why people go into the field of education. Given a certain set of circumstances, most people will do as little as possible to get by. When you enroll in a racist graduate school, the assumption is that no black can do mathematics, no black can do physics, no black can do chemistry but might be able to do a little biology. However, you are received warmly, cordially, in the Education Department. You would be a fool not to accept that for, after all, when you return to your state, all it cares about is that you are now a doctor of philosophy and, as such, you will earn a higher salary. We must recognize the reality of what is in front of us, and then we have the very important problem of how to combat situations such as this. What do we do with an unfeeling society? and let me tell you what I mean by an unfeeling society.

Pennsylvania is a great state and in reviewing the data for 1973-74, of all the doctoral degrees given in the state roughly 4 percent went to blacks (3.9 percent). In 1976-77, although you would have expected some progress,

only 2 percent went to blacks. That is a 50 percent drop in the number of blacks in that period receiving doctoral degrees in Pennsylvania. If that had happened in the majority population, there would have been a government commission set up to find out what had happened. Did the supply of brains which we will need in the future drop by 50 percent? The figures only excite us, though; nobody in Washington reads them. They think it happens to blacks just because it does.

You and I must realize the kind of battle we are in. Perhaps it is management that should take on the battle, but it should also mean something to you. What it should mean to you is that you have to work twice, three times as hard. The young people who will be your students are sure to have horrendous handicaps, very weak backgrounds in every respect. They are going to be culturally and socially deprived. Their motivation sometimes may be faulty--they will want to be doctors for the wrong reasons: they will want to have big cars, lots of money--which seem to be the reasons many people go into medicine.

How do we work with them? I think this is the area in which management should be working with you. We must look closely at our neighborhoods to find out what is going on. Gerald Zacharias and I have been working on a proposal recently. We think we are going to have to intervene in the secondary schools and perhaps even lower to find out what is going on. Some people believe that the 6th grade is the most crucial place because that is

the grade at which students stop taking mathematics. The 6th grade may be the crucial one, because it is here that students begin to diverge. We need to so something in the secondary schools and I urge you to ask management to help you.

We must also keep in mind the nature of our society. In 1979, the tragedy is that we are essentially a verbal society in which a great deal of honor goes to people who talk. They don't have to say very much or mean very much when they talk, so long as they talk. Our young people are succumbing to it; they may not know how to solve problems, but they are rewarded for their talk. The really significant things in our society are missing and you and I have the responsibility of bringing them back to the students. That is why the sciences are so important. We must make certain that our young people have genuine intellectual skills, that they understand the nature of the world and of man and that they can go ahead and learn these things. They must know what is going on, they must keep abreast with the significant developments of the last ten years, and they must learn about them if they wish to do anything significant with their lives.

We must keep clearly in mind what our responsibilities are. We must treat this conference with a great deal of seriousness. We must look at our programs and look at the young people who are out there and we must somehow take them and set up programs at which you and they are going

to have to work hard. You must work hard to make certain that the young people are understanding and are gaining insight. And if you do not stick with them and see that they are sticking to it, they will not gain understanding or knowledge. They may have a superficial knowledge, and they may be adept at using words, but they will not have the kinds of things which will help them move into the sciences and engineering fields with success. It is up to us to help them, and it is up to management to help us.

"Recruitment and Retention"

Michael Olivas
Senior Fellow and Assistant to the
Director of Research
Institute for the Study of Educational Policy
Howard University

I would like to comment upon the distressing statistics which have been presented by my colleagues. As long as minority students enter two-year colleges in disproportionate numbers, we will be bombarded by these appalling statistics. Junior colleges have been touted as providing access for all, but the truth is that these colleges represent the only option for minorities in many locations. And, since these colleges are generally funded on local tax bases, the system will continue to "give to those who have."

It also behooves us to look at full-time undergraduate enrollment at these two-year institutions (see Appendix for table). A full 27 percent of all white full-time undergraduates is enrolled in two-year colleges, while 37 percent of all black full-time undergraduates is so enrolled. The comparable figures for Hispanics and Native Americans are even more intolerable: 45 percent and 48 percent, respectively. At these institutions, the statistics on minority representation among the faculty are even worse.

In order to graduate minority Ph.D's, students must enter institutions which pursue basic research. In this regard, it is useful to look at the proportion of NSF funding that is devoted to science education and basic

research. Over the last twelve years, the NSF budget for basic research has increased by 113 percent, while the budget for science education has decreased by 78 percent. Since science education is comprised of curriculum materials development, in-service training for teachers, and other such activities, that this portion of the NSF budget has decreased is evidence of an attempt to pit designated minorities against one another in their efforts to get limited targeted funds. Thus, it is important that we recognize the significance of political activity in science education and research. It is useful to note here that the area of science and education administration is only slightly less underrepresented by minorities than are scientific research fields.

Further, we must learn to help our students and their parents negotiate the necessary systems. By systems, I am referring to how to take standardized tests, how to complete the proper financial forms, etc. This is a crucial issue for many historically black institutions, for 80 to 90 percent of their income is derived from governmental financial assistance programs.

In conclusion, let me say that those of us at minority institutions must be better than our colleagues at majority institutions. We must prepare and follow through with proposals for targeted programs. We need to look at all of education as a continuum, and stop blaming our colleagues at the elementary and secondary

levels for the poorly prepared students they send us. And, lastly, we must learn how majority institutions have followed the dollar.

"Careers"

James M. Jay
Professor of Biology,
Wayne State University

About 45 percent of black Americans holding doctoral degrees in the natural sciences is in the life science fields, whereas about 31 percent is in chemistry. This is based upon information on approximately 1,400 individuals in the author's files covering the period 1876-1977. During this period, only about 150 blacks earned the doctoral degree in mathematics, about 100 in physics, and about 90 in the engineering fields. The agricultural sciences accounted for about 85 doctoral degrees and the geological sciences for approximately 12. I am aware of only 4 blacks who have earned doctorates in astronomy, 2 in meteorology, and one in oceanography. Among the life sciences, the zoological sciences have been chosen by more persons than the botanical science fields in which there are approximately 80 only. Microbiology/immunology/virology are represented by about 160 individuals. About 70 percent of the blacks who have doctorates in science is employed at educational institutions, mostly in the South.

The choice of degree fields appears to parallel the emphasis on science teaching at the historically black colleges, from which approximately 75 percent of all blacks with doctorates in science obtained their first degree.

The paucity of blacks in the physical sciences may be a reflection of either the lack of blacks from the North entering the science fields, or the relatively low numbers of black males who graduate from college (approximately 60 percent of white college graduates is male, whereas only approximately 45 percent of black college graduates is male), or a combination of both.

Whereas only 14.4 percent of the science doctorate pool of all U.S. doctorates for the years 1920-1974 came from the South, between 70 and 80 percent of black science doctorate holders is from the South. The lack of performance by black males in Northern cities could well be the single most important reason for the general lack of blacks in the physical science field, and ways in which to correct this situation are badly needed.

"The Role of Research"

Edison Fowlks
Chair, Department of Life Sciences
Bishop College

Some years ago at Bishop College, traditional approaches to the teaching of biology convinced us that biology should change--that we should use the molecular approach as our base and thus have a foundation for teaching the structural-functional relationship of organelles, organs, and organ systems.

The first step was to develop a strong research base, the rationale being that we would then be in a much better position to recruit young talented altruistic scientists who could have a great impact upon the development of a superb undergraduate program. Uppermost in mind was the idea that the spin-off from a strong research program was as valuable as the research itself; the thrill of discovery spills over into the classroom and creates a positive effect on the total educational environment. Thus, at undergraduate institutions, the philosophical cornerstone would be student involvement in the actual experimentation; students would not be used merely as "pairs of hands to wash glassware," but as co-investigators in the pursuit of scientific phenomena. Behind the respect for and faith in student researchers should be the belief that students who experience a "high" when they see the beauty of a new scientific concept unfold in the laboratories

will be "turned on" to the pursuit of a science as a career.

Research has existed at minority institutions for decades. Here at Atlanta University, some of you may remember the long hours the late Dr. Kimuel Huggins spent in his research laboratory under some of the most trying conditions. He spent his life trying to synthesize cyclobutadiene. The tragedy of his research was that he might very well have synthesized it without knowing that he had--because he did not have sophisticated instrumentation, such as NMR, at his disposal. In spite of this, he and many other black scientists kept the "torch of research" burning at black colleges and universities.

Today, however, conditions are different. About ten years ago, the National Institutes of Health initiated the Minority Biomedical Science Research Support Program. This program brought real hope to the undergraduate colleges. Through research grants, undergraduate institutions have been able to build some of the most impressive facilities for research and research training. Individuals with an interest in research have had an important influence on the entire science program and provide a quality academic program which these institutions otherwise could not afford; moreover, they create a climate which encourages the quest for truth.

The quest for truth should be fundamental to student training at undergraduate institutions, especially minority institutions. For, with a knowledge of science and

the necessary tools for research, we may be able to find those truths that will keep man free or will prevent man's inhumanity to man--or we may be able to find a solution to cancer or sickle cell anemia or new sources of energy.

"Resources and Funding"

John T. Hayes
Chair, Division of Natural Sciences and
Mathematics
Paine College

This report addresses three questions:

1. What has been the pattern and level of federal funding for research and other programs at historically black colleges and universities in the United States?

2. How effective have these programs been in achieving objectives, such as increasing the numbers and qualifications of black scientists?

3. What recommendations might be made for improving the effectiveness of federal programs in achieving such objectives?

The six agencies which have provided the majority of federal funding for programs at historically black institutions are identified as the Atomic Energy Commission (now Department of Energy); the Department of Health, Education, and Welfare (including the National Institutes of Health); the Environmental Protection Agency; the National Aeronautics and Space Administration; the National Science Foundation; and the United States Department of Agriculture.

Positive efforts and increased funding levels were shown for these agencies for the period under study. In many cases, funding levels to specific groupings of institutions (such as "private") had leveled off or even dropped by 1976, compared to one or more earlier years. Possible

reasons for this effect are discussed.

The numbers of students enrolled at the historically black colleges have increased in the period under consideration. Graduates in the sciences have also increased, but mostly in the social sciences.

The quality of graduates, as measured by increased percentage of acceptance into graduate schools, has also increased.

Conclusions and recommendations are discussed, including better data collection, increased funding to parallel increasing size of the pool of eligible institutions, and the development of models for institutional development in relation to federally-funded programs.

While addressing specifically the black colleges, the model proposed turns out to have general applicability to all institutions of higher education in the United States.

The findings of the present report are preliminary, in that further study is needed to provide more detailed data in certain areas, and to develop specifics for the conceptual model proposed.

"Federal Agencies
the Black Colleges and
Universities"

RCSE Report #2

John T. Hayes
Chair, Division of Natural Sciences and
Mathematics
Paine College

THE COMMUNITY OUTREACH COMPONENT

"The Saturday Science Academy - One Program of the Community Outreach Component"

Melvin R. Webb
Assistant Director
Resource Center for Science and Engineering

(This presentation was accompanied by viewing of a short videotape which focused upon the activities of the Saturday Science Academy.)

The Saturday Science Academy is a program that enrolls minority children, grades 3-8, in an academic program on Saturday mornings. The program offers courses in science, mathematics, creative expression, and computer graphics. In addition to the academic program, the Saturday Science Academy provides lunches and a recreation component. Each child in the program is involved each Saturday from 9:00 a.m. to 3:00 p.m.

The literature on science education indicates that it is extremely important to expose children at a very early age to quality instruction in science and mathematics that is both exciting and activity oriented. Among the reasons cited for such early exposure are the following:

1. Attitudes toward science and mathematics are being formed at an early age.

2. The critical state at which pupils' attitudes toward science can be influenced is between the ages of 8 and 14.

3. The attitude of many students toward science and mathematics begins to become negative around the 6th grade.

Several national studies, including the Ohio State University study, published in 1974, and the study by Iris R. Weiss at Research Triangle Park, North Carolina, published in 1978, clearly indicate that there is a need for improved instruction in science in the elementary schools. These studies point out that many elementary teachers do not feel prepared to teach science, that insufficient funds for equipment and supplies are provided, and that inadequate time for science instruction is available. Science seems to be of secondary importance and amounts to little more than a limited, textbook-oriented exposure at the end of the instructional day. These conditions impact negatively on children in general and minority children in particular.

It seems to me that any effort to address the issue of minority underrepresentation in science, mathematics, and engineering must reach minority children at the identified critical years. This is why programs such as the Saturday Science Academy are so important. Our program, while not original in concept, contains several factors that set it apart from other programs and make it successful where other programs have failed. The Saturday Science Academy takes advantage of the child's natural curiosity and desire to learn. We place the children in an environment in which innovative skills are encouraged and supported by the college professors who are not only specialists in science and mathematics, but also have considerable experience in working with children in the 8 to 14 age group.

Our academic program includes a laboratory-oriented science course, a discovery learning mathematics course, a creative expression course, and a "hands-on" computer graphics course. The response of the children to our program has been tremendous. The attendance rate exceeds 95 percent. We presently have 110 children enrolled and could easily double that figure provided adequate staff and facilities were made available. Our plans for next year include expanding the program to include at least two hundred students.

The Saturday Science Academy provides minority children with an exciting and early exposure to science and mathematics during the critical years when relevant attitudes are being formed and continues through the years in which the attitudes toward science and mathematics of many children have become negative. The results of our efforts should increase the number of these children who will enter high school with positive attitudes toward science and mathematics and, additionally, who will believe in their ability to master these subjects, thus providing an increased pool of potential minority professionals in science and mathematics.

Toward the end of our funding period, we hope to have successfully encouraged our participating institutions to establish similar programs in their communities. Collectively, our efforts could provide a geometric growth pattern with respect to minority participation in science, mathematics and engineering.

ADDRESS

"Knowing Comes First"

Herman R. Branson
President
Lincoln University, Pennsylvania

Thank you, ladies and gentlemen. It is true that perhaps we should not have been paid for many years, because teaching has been a great joy, a great significant pleasure and that is why we are here today. Teaching is a different profession, not like an automobile mechanic, not even like a lawyer, or doctor. This is one where you really must act on young people, and your fundamental commitment is to the future with the hope and expectation that they will take on some of the qualities that you think are essential--that they will go and make this world a place where all of us may enjoy the amenities of civilization and live a more enjoyable existence.

When Paul Brown asked me for a topic, I told him I thought that we should look at it as something which is basic--so I said put down "Knowing Comes First." That's a very simple statement, but it is also I think a very serious statement. Perhaps we cannot, where we are, modify profoundly what's happening to our young people before they reach us; they need some help. We can do some things; we can do little things and we want to do them and we are going to do them, I am certain. The

wonderful Saturday morning session here is magnificient, and I hope others of us are going to be doing it in other primary schools, in other places; we want you to continue. But remember, there's an adage about hunting that says if you are going to hunt elephants, you had better carry something other than a .22. The Philadelphia school system, for example, if you wanted to do something, there is an elephant. It has 270,000 students and an annual budget of over $600 million a year. It would be foolish if I went in there to modify the Philadelphia school system with a weapon like the National Science Foundation wants to kill a $600 million elephant with $2.8 million. But we can do something and that something is what I want to talk about now. I want to talk about it, I hope objectively, in a sense that you and I have to go back and do some things. Let us see what we have to do.

First off, I enjoyed very much the presentations this morning, but we are forgetting our history to a certain extent. Those things didn't happen by accident. All of you should know that in May of 1970, a group of us went to see Mr. Nixon. We said to Mr. Nixon that the federal government is spending over $4 billion a year in higher education and the predominantly black schools are getting less than 3 percent of that. Mr. Nixon turned to Mr. Allen, Commissioner of Education, and said, "Jim, is this true?" and he said, "I am afraid it is." We got from him at that time a promise that we could go to all the federal

agencies and point out what was going on. And we urged him to do something for the predominantly black colleges. That's why suddenly things started happening. They don't happen because of pious statements; they happen because somebody works at it, and tries to get it done. And that's exactly how things are going to continue to happen. Give encouragement to the people in Washington; give encouragement to the National Association for Equal Opportunity in Higher Education. You must continue this type of activity. Now things are better, but remember things could be a heck of a lot better and still not good; and that's where stand: they are not good, they are better, and they are bad in one sense or even worse in one sense when one looks at some phenomena that we do not seem to pay enough attention to. One example is this: last year the Association of American Medical Colleges had a committee which went out looking at the minorities in medicine. We found something which was unpleasant and it should frighten you. There is a deep-seated aversion to believing that minority people can do anything in America. Just remember that. Therefore, when I went as chairman of this committee to visit a prestigious medical school, I discovered in looking at the data, that roughly ten years ago, every minority student in that school was from a predominantly black college, and those young people did well. They came in with difficulties, but they made it through; more than 80 to 90 percent of them graduated from medical school and have gone on to perform well. This year not a single minority student in that

medical school is from a predominantly black college. What happened?

In the meantime more blacks have been going to the majority colleges and the primary assumption was made that any black who goes to a predominantly white school is a better student than one who went to a predominantly black college, irrespective of anything else you might say. That is what you and I are battling against--that kind of pervasive racism. That is why we must do a better job. That is why we must continue to battle this sort of thing. That's why we must continue to talk to these people and say--look, I've got a kid down here now who is really a crackerjack and you've got to come and see and give that youngster a chance. We met with the young black people in that medical school; they were from Swarthmore, and Yale, and they were in medical school, not a one of them, as I've said, was from a predominantly black college.

I did a graph of the data. It is still true that predominantly black colleges are producing roughly twice as many blacks with bachelor's degrees as predominantly white colleges. But the data on blacks going into medical school now is just the inverse of that. Roughly one third of the black students going into medical school are coming from our predominantly black colleges; two thirds are coming from predominantly white schools. Those are the latest data I got together. In other words, we are being squeezed out in this preliminary preparation of our young

people for professional careers. Then it is going to be very easy for others to say, "well, those colleges are not doing anything;" this is what you and I must battle.

How do we battle? One, we must go back and we must look at that Freshman class, look at the top 20, 30, 40 or 50 students and then decide: I am going to work with these young people, I am really going to work with them, I'm not just going to talk to them. I am going to see, for example, that they lay the foundation in analytical thinking; I am going to see that, where possible, they are going to build up their interests, and their reading, so that they will do certain things. For example, here's a little weekly periodical called The New Scientist that comes out of England. I couldn't find anybody who had read it, and yet it is something which a lot of people who have an interest in science ought to be looking at. It has sort of a general science theme but it keeps you abreast of developments all over the world and it has a very good orientation. As a matter of fact, I am pretty certain about what the entire editorial board and the associates think about dark people; they really do a fine job, they dig it out.

This particular issue I brought along has an article which is called "The Dangers of Double Standards" and that's why I want to refer to something Dr. Jackson and I were talking about at breakfast this morning. And that is-- we must not be pushed entirely into science education. Let us understand that we have got to be doing some basic

science ourselves. It may not be the basic science that's going to get a Nobel Prize, but if our programs are going to be alive and of value, we must be in there doing science. This article, for example, has this to say: "It is a serious error for scientists in developed countries to advise their colleagues elsewhere to concentrate on utilitarian research at the expense of fundamental science, if the former are not prepared to do the same." In brief, it you do science education, you must do science. Otherwise, the science education which you are doing will be out of step and really without substance. That is something else we are going to be emphasizing--I am so delighted to see those figures showing that we are doing basic science because science is not stagnant. If you want to do it in the classics, of course, you would say "I would do nothing after Cicero" which would be perfectly legitimate--but in science, if you say "I will do nothing after Galileo," you are in one hell of a mess. This is a point I think we must keep on pressing.

Let me mention just three qualities which I am going to ask you to look for in the young people you are working with: Number one, you must ensure that these young people are gaining skills which are both analytical and quantitative--I wouldn't call it mathematical because then the people in math will think the students belong to them. You may face a great deal of opposition from your colleagues who feel as though you are trying to take their best students.

What you must work on and this is absolutely

essential is more than mathematics; it's mathematics plus problem-solving, plus insight into how things are done.

Number two, which I urge you to work on, is something called "ideas and their expression." Now, normally, this is the province of the English people--but don't let them do it all because "ideas and their expression" is a much broader area. The important thing is that all of us, particularly those of us in the sciences, are responsible for ensuring that our young people get the ideas, know how to express them forcefully, and how to go about putting them to work. That's why reading is such an important and essential activity to the sciences.

And a third area that I hope you can do something about, and you must do something about, is what we call the psychological factors with minority kids. Certainly you must be concerned about motivation. Certainly you must be concerned about all the other things which pertain to habits of thought and judgment. But also, perhaps you should be the person on campus who is pushing for a deeper understanding of young people. What has impressed me terribly, and well, unfavorably, I should say, is the fact that so many of our folks don't try to understand them. You must remember that blacks come in always with two extremely important, extremely debilitating psychological handicaps. One is what we call pro-active interference. What is pro-active interference? It means that this kid has picked up something in his neighborhood

or at home which makes it impossible for him to accept an idea that you might present in class, because this other experience will interfere. That is especially true in fields like "ideas and their expression."

When I was in New Orleans on my first teaching job, someone swore he was waiting for the trolley there on Tulane Avenue and heard one boy turn to another and say, "Is you done your Greek?" Now that is pro-active interference. He had been saying "Is you?" for years; his old habits interfered--you will recognize this. All people are like that. The reason why certain cultures don't produce scientists is almost always due to pro-active interference. The youngster comes in with a certain number of concepts and cannot, for example, get these new concepts to move the old ones out so that he can be critical, ask frank questions and be on his way to becoming a scientist.

There are those who say, for example, that the Catholic Church in America does not produce as many scientists as it should. It's been attributed to the fact that a youngster growing up under this philosophy just doesn't get to the point where he can question authority and say "this is wrong, let's see what could be right." And other cultures are like that. Pro-active interference is something that we should understa and expect, especially when we get a youngster who may be fundamentally brilliant but whose cultural background and experiences make it impossible for him to understand science and scientific thinking.

Now the second type, you could guess, is retro-active interference. That means exactly what it says. Dr. Halson Eagleson always tells a story about that. It happened down here in Atlanta. He said a visitor came to a school down here and asked some students, "How can I find Mrs. Smith's classroom?" "Oh, Mrs. Smith, 'hur' classroom is 'rite' down there on the left--you goes there and turns left." So he said, "Now, wait. Mrs. Smith wouldn't let you talk like that. Mrs. Smith would have told us that her classroom is down on the left." He added, "Why do you talk that way?" "Us forgets." Retro-active interference--once you learn it, you go out but at home it is not used that way, among your peers it's not used that way, and therefore you have a great deal of difficulty accepting it and really making it a part of you. That's a very important point and we must be sensitive to it.

We must recognize that we have a much more difficult job with our young people than other people have because of these factors. If a youngster comes to you, for example, from a fundamentalist home, you may have a very hard time getting over some of the ideas of modern science. Recognize it, know it and figure out how to achieve your objectives in light of this restriction. You look at what the problem is, then you attempt to solve it. Don't say, for example, that it's the student's fault if he doesn't understand. No, we can't do that. The stakes are too high. The very existence of our institutions continues

to rest upon our finding effective ways of working successfully with these young people.

So, those things are the psychological factors. I would like to give you a few others. Another point which we have not made use of, and which we should, is to try to emphasize to our young people their increased importance in the modern world. The largest number of black people in college in the world are in America. The tragedy is that we are not learning the things which we should--which would enable us to be of value to black persons elsewhere. The very things that you and I are concerned about would do that. But other people seemingly are not giving us the help.

A few years ago I was sent as a representative to the Association of African Universities. Coming into Ghana, there was a lady on the plane who was so full of the spirit of Mother Africa that she wanted to hurry back to Mother Africa. When the plane landed in Ghana, she jumped off first, got on her knees and kissed the earth of Mother Africa. The Ghanaian official asked what the hell was wrong with her. They apprehended her. She never got out of the airport. In talking to the people there, they said "send us someone who knows something about tropical pediatrics, send us somebody who knows something about hematology--that's those little worms in the soil--you know, we can grow our own ground-kissers here. Send in people who know the techniques of the modern world, understand the procedures, but you send us

people like this lady and we will send them back."

Every time I pick up either the Economist or The New Scientist, I find, for example, the University of Nairobi advertising for faculty people. But they weren't looking for ground-kissers, they were looking for research fellows in economics. Or go down to the University of the West Indies, they need a senior lecturer in agricultural economics. Or you can go over to Dar-es-Salaam--it's over on the Indian Ocean, over in Tanzania. It's a magnificent city. It has another distinction, it has streets named for two Lincoln Alumni--I am impressed by that. There's Nkruma Street and there's Azikiwe Street. But what's important here is what people were seeking. They were looking for somebody who knew something about modeling an economic unit, computer science, things like that. That is what they advertise for, this is what they need and we ought to be supplying those people--we ought to be a source.

In America there are a million black people in colleges and I know we are producing some able hematologists, some economists--but we don't have enough of them. So, ladies and gentlemen, in these three days, I know you are going to have a wonderful time, you are going to look at these honest issues, you are going to think about them and we are going back and really do something. Perhaps I should remind you of something I used to tell my classes--that I never knew the Nobel Prize to be given to anybody who had a good excuse for not doing something, or a good explanation for why something was not done. Prizes are

given to people who, under the most adverse circumstances, do achieve. Therefore, I don't think we want to look at any fine plans coming from your schools, any beautiful elaboration of basic theses which was brought from the Atlanta meeting. We don't want to look at that. What we want to see in the next year, or year after next, is many more of our black people coming out of our institutions with the intellectual skills, social skills too, and, above all, that humanistic orientation that will enable them to move and function in the demanding world of the twenty-first century. That is what we are looking for. And if we don't achieve this, no number of reports, no number of explanations will mean a thing. We must reverse this trend that we are seeing in the medical colleges, where the number of students coming from our schools is fewer and fewer. If that doesn't improve, then we cannot refute people--an eminent humanist, who was on a commission, we almost got into a fist fight. He didn't expect to find any real good people in English from black colleges. I do expect to find first-class young people, because they exist. Nobody knows where our human ability and intelligence are distributed and nobody can tell me. A Warren Henry coming out of Evergreen, Alabama, getting a Ph.D. in chemical physics at the University of Chicago. This is the kind of thing we want, and passing through our halls will be people like Warren. If you were to ask me, for example, I might mention that a few years ago Patricia Roberts Harris was a student at Howard. Or Andrew Young,

pretty good Atlanta boy, who was a pre-dental major at Howard. In those days, Chris Eadley, who now is head of the United Negro College Fund, came to Howard after being rejected by a majority institution--a bright young man, who graduated cum laude. Or a judge, a black judge with whom I came down on the plane from Philadelphia. He's a very fine man now, took physical science at Harvard, flunked out at Harvard, went to another institution, somebody took him in hand, molded him, he went to law school, came out, practiced law, did well, and now he's a judge. Our successes are outstanding. We have so many instances where if somebody will take someone on and work with him, then you can achieve wonders with our young people. I suppose Dr. Sales and Dr. Brown, what we are really asking for is a new slogan: "Opera Non Verba"--"works not words." Actually, the best motto for college presidents which I believe I have heard--because it is still true--is a Latin motto, which goes back to 79AD: "Pecunia non olet"--"Money does not stink." Money from the John Birch Society--we will clean it and use it. We'll take it from the NSF and anybody else.

Each of us must go back and show positive results. And that can mean only one thing--that coming from our institutions over the next years will be more and more young people with the competencies that will sustain and contribute to the twenty-first century. If we do that, I am confident that the organizers of this meeting will be delighted. But more importantly, we would have made a contribution which perhaps is more needed than any other

in our society.

Thank you, my friends. May success go with you and I am confident that we will go forward.

DISCIPLINE GROUP SESSIONS

"PROGRAMS FOR MAJORS"

I. BIOLOGY

Problems and Concerns

1. What courses should be included in the required courses?
2. What courses should be included as restricted electives?
3. Should an undergraduate college emphasize research?
4. What should be the content of the basic course, as it relates to other courses in the curriculum?
5. What should be the sequence of the supporting courses for a biology major?
6. What correlations should be made between the design of the curriculum and the possibilities for employment?
7. What are some of the areas in which employment possibilities are above average?
8. How much consideration should be given to the reading ability of students when choosing textual materials?
9. How important is it to prepare and utilize excellent syllabi?
10. Should attempts be made to integrate the subject matter of the various courses?
11. Should problem solving and quantitative skills be stressed?
12. Are there means other than monetary ones for the support of programs?
13. What are the possibilities among institutions for

collaboration in the utilization of resources?

14. What are some of the sources of funds for the developmental programs?
15. What course of action should institutions pursue after having received "seed money" awards?
16. What are the possibilities for cooperative endeavors with state and federal agencies and projects and with industry?
17. How much mathematics should a biology major take? Should calculus be included?
18. How much chemistry should a biology major take?
19. How much physics should a biology major take?
20. Should environmental science be included in the curriculum?
21. What guidelines should be followed in setting up the curriculum?
22. Should honor societies be emphasized?

Strategies and Approaches

1. Morehouse College is tracking via a sequence of courses, as follows: General Biology (1 yr.). Cell Biology, Anatomy-Development-Physiology, Molecular Biology, Biochemistry; Senior Year Electives: Environmental Biology, Genetics, Advanced Biochemistry Seminar, Biological Problems. The Department maintains a strong research emphasis.
2. Paine College requires: General Biology (Principles, one year), Cell Biology, Genetics, Invertebrate Zoology,

Comparative Anatomy, Plant Physiology, Systematic Botany. Electives are chosen on the basis of the student's interest and career goals. Research experiences, both on and off campus, are available, e.g. the Savannah River Project.

3. Jackson State University emphasizes strongly its General Biology course (using Helena Curtis's book as a text) as opposed to the one-year Botany/1 year Zoology sequence.
4. South Carolina State College requires a Botany/Zoology sequence of all majors.
5. Florida A&M University has a two-year core sequence consisting of General Biology, Botany, Zoology, Historical Concepts and Terminology, Ecology, and Comparative Anatomy. Electives are taken on the basis of student's interest and career goals.
6. Benedict College has replaced the Botany/Zoology sequence with a course called Principles of Biology.
7. Savannah State College has instituted a modern biology core. The courses are Principles of Biology, Cell and Molecular Biology, Organismal Biology, and Environmental Controls. Electives are taken on the basis of student's interest and career goals. Inorganic Chemistry is taken during the Freshman Year.
8. Bishop College offers two semesters of Molecular Biology.
9. Winston-Salem State University has a three-track program: (1) Traditional, (2) B.S. in Biology (Basic Preprofessional in Medical Science), (3) B.S. in Biology

(Microbial). General Chemistry is taken in the Sophomore year in Track 1 and in the Freshman year in Tracks 2 and 3. Majors begin to concentrate in their Junior year.

10. There was a general consensus among the participants that the reading level of many of the students provides serious handicaps, particularly in light of the fact that most of the newer texts stress Molecular Biology. The key items, which were sanctioned by most of the participants in addressing this problem, included flexibility in the selection of courses for students on an individual basis, and the tracking of students.
11. There was general agreement that the curriculum should be designed to enable students to take advantage of the current job market. This is of particular importance in providing electives for students. It was pointed out that there are studies available which address this problem.
12. Many of the participants agreed that Environmental Biology should be included in the curriculum. Some view it as an integrating capstone course that is quite important in terms of current concerns in science and career options for students.
13. Jackson State University has a Marine Science program. It was also pointed out that several states have consortial arrangements with which institutions could become affiliated. In addition, there is an abundance of career opportunities available to graduates in

this field.

14. Fort Valley State College has a concentration in Fish and Wildlife Biology.
15. Savannah State College has an Environmental Science program.
16. It was suggested that instructors should prepare good syllabi, regardless of the text being used, and share them with persons at other institutions. This could lead to clarification of the meaning of descriptive titles and contribute to uniformity in course content.
17. There was general agreement among the participants that the instructional programs should be designed to enable the students to integrate the subject matter studied in the various courses.
18. It was brought out repeatedly that problem solving and quantitative skills development should be included in the various courses.
19. All the participants agreed that students should be provided with an abundance of hands-on laboratory experiences, particularly instrumentation.
20. Attention was called to the fact that external resources need not be restricted to monetary support. Among the possibilities are consortial arrangements, surplus equipment, and the formation of research groups.
21. There was general agreement that continuing programs of faculty development are necessary in order that funds for biological research can be successfully procured from sources other than the minority programs,

such as Minority Access to Research Careers (MARC) and Minority Biomedical Science (MBS) programs.

22. The consensus of the group was that the mathematics requirement should include a calculus component; however, some participants were not so sure about its utility.
23. It was recommended that the chemistry requirements should include the following: 1 year of General Chemistry (including Quantitative), 1 year of Organic Chemistry and at least one good course in Biochemistry. Savannah State College includes Qualitative and Biophysical Chemistry in its requirements.
24. It was recommended that at least one year of physics should be required of all majors. Electives are required at Benedict College. Others suggested biophysics. Still others suggested that the restricted electives should include computer science.
25. It was observed that the American Institute of Biological Sciences (AIBS) set some guidelines for curricula in biology, but these guidelines are not as good as those set by the American Chemical Society (ACS). Biology has nothing that is equivalent to the guidelines of ACS.
26. It was recommended that the Resource Center for Science and Engineering take the lead in setting up guidelines for undergraduate curricula.
27. It was the consensus of the participants that institutions should promote honor societies and research clubs for their students and that institutions should

provide funds to support the activities of these organizations.

II. CHEMISTRY

Problems and Concerns

1. What guidelines should be used in designing the curriculum?
2. How important is national accreditation?
3. Does accreditation ensure a quality program?
4. How important is administrative support in seeking accreditation?
5. Is accreditation cost-prohibitive?
6. What does a pre-chemistry curriculum provide?
7. How does one predict success in chemistry?
8. What is the importance of laboratory exercises in the development of students?
9. Is tutoring a good supportive service in the development of students?
10. Should tutorials be included in the curriculum?
11. How much emphasis should be placed on problem solving?
12. What are the possibilities for collaborative arrangements involving resources among institutions?
13. What course of action should be taken to standardize courses?
14. Should credit hours be awarded students for their research projects?
15. What proficiencies should students exhibit before being admitted into a major program?

16. What should be the format of the seminar program at undergraduate institutions?

Strategies and Approaches

1. The standards which are used by the American Chemical Society (ACS) for accreditation should be used as a guideline for setting up the curriculum.
2. ACS accreditation has been of inestimable value to graduates of minority institutions; it has increased career options and employment opportunities.
3. It was noted that ACS affiliation does not guarantee that a program will provide quality instruction nor that all graduates will be fully competitive. Rather, such an affiliation enhances the probability that the curriculum and the training programs will benefit the students.
4. Administrative support is of the utmost importance in seeking accreditation; this is particularly true as it relates to funding, because accreditation requires considerable amounts of money for equipment and other programmatic essentials.
5. Some institutions, including Central State University, have instituted a pre-major program of training for its chemistry majors. The following was reported concerning it:
    a. Freshmen are grouped; each one takes a one or two credit hour course in chemistry
    b. Freshmen do not enroll in laboratory sections during the first quarter; therefore, they will have had an opportunity to learn some basics prior to the laboratory experience.

c. Students do not become as discouraged at failing the first course, because it carries less credit. Therefore, it can be made up more easily.

d. Some problems were encountered in scheduling the courses under this format.

6. Some participants felt that laboratory exercises should be utilized instead of pre-chemistry courses, because the laboratory experiences enable students to develop their ability to observe and interpret phenomenon.

7. There was general agreement that the cumulative grade point average from high school is the best predictor of student success as majors.

8. Participants reported varying degrees of success with their tutoring programs. Many of these sessions involved students and faculty members, or both, serving as tutors. Some sessions were held in the dormitories, while others were held on Saturday mornings. Drill sessions were reported to be among the most successful approaches.

9. It was agreed that departments should add at least one tutorial which carries one credit hour.

10. It was recommended that instructors place emphasis on logic and problem solving very early in the students' career. It was suggested that instructors should create stress situations in order to enable students to develop their ability to think clearly in stress situations., e.g., time scheduling work helps to build confidence.

11. It was suggested that the teaching of chemistry and

mathematics would enable students to understand interrelationships better. Thus, problem solving skills are enhanced.

12. It was recommended that institutions effect interaction arrangements, such as joint sessions and/or monthly meetings, in order that there could be a sharing of expertise and the utilization of collective resources.
13. It was recommended that the Resource Center for Science and Engineering set up a committee to ascertain the correlation between the American Chemical Society examination and what is being taught at the institutions. Thus, the Resource Center could produce examinations designed to aid in the process of ensuring that standardized courses are offered in the institutions.
14. It was recommended that undergraduate research be strongly encouraged in all of the institutions and that the students receive academic credit for their projects.
15. It was suggested that proficiency examinations in reading, writing and mathematics be administered to students prior to their being admitted into the major.
16. It was recommended that departments conduct a seminar course each semester. There should be student seminars in which students submit abstracts and make presentations. Faculty members should serve as advisors and evaluate the students' presentations. The other seminars would be presented by faculty members and outside speakers.

17. It was recommended that the Resource Center for Science and Engineering undertake the following:

    a. Appoint a committee to compile a roster of potential speakers or seminarians.

    b. Identify and procure funds to support the seminar program.

III. MATHEMATICS AND COMPUTER SCIENCE

Problems and Concerns

1. Are there content gaps in the mathematics offerings at the various levels of instruction?

    a. If such gaps exist, what are the reasons and what are the consequences?

2. In what subject matter areas do the students seem to have the poorest preparation?

3. Is there evidence to support the notion that retrogression takes place?

    a. If retrogression takes place, what are some of the probable reasons for it?

4. What is the role of the counseler as it relates to advising students about mathematics courses?

5. What should be the role of the parents in monitoring the program of studies of the students?

6. Is it fiscally feasible to extend the programs of study an additional year?

7. Is there evidence that a five-year program would produce the desired change?

    a. Is remediation the answer?

8. How can curriculum management and changes in graduation requirements be used to improve the mathematics back-

grounds of secondary school graduates?

9. What information is needed in order to address the problem of inadequate preparation in mathematics?
10. What are some of the activities that may be utilized to cause students to become interested in becoming proficient in mathematics?
11. What organizations and administrators should be involved in addressing the whole problem of quantitative/mathematical literacy?
12. What should be the background of the persons who teach mathematics in the elementary grades?
13. What kinds of data could educators use to influence elected and appointed officials to bring about a change?
14. How significant is the teacher in influencing students' attitudes toward mathematics?
15. What are major considerations in the design of a mathematics program?
16. How can scholarly endeavors by instructors in minority institutions aid in improving the mathematics programs.

Strategies and Approaches

1. There was general agreement among the participants that there are some serious content gaps in the mathematical offerings at all levels: elementary, secondary, and university. Many persons believe that these gaps are caused by instructors who are more interested in preparing the students for the next course in the curriculum rather than in emphasizing the fundamental

content. The solution appears to be more communication between the educators at all levels in order to ensure that the sequential nature of mathematics is accorded its requisite importance and that the fundamental content is not neglected.

2. It was the general consensus of the participants that students entering these institutions are poorly prepared in algebra and geometry. Thus, there is the problem of providing college students with concepts and proficiencies which they should have acquired at the secondary level. A probable solution to this problem would be the same as the one for the preceding item.
3. There was general agreement among participants that students forget what they have learned. One participant cited an instance in which definitions of concepts taught in calculus were not retained by students in a numerical analysis course. Among the reasons offered were: (1) basis concepts in calculus were not understood; (2) they are not clearly defined in the textbooks; (3) they are not verbalized while techniques for manipulating symbols were being developed. The solution to such problems are instructional improvements which emphasize reinforcement exercises that necessitate utilization of information previously acquired.
4. It was generally agreed that many of the students need a five-year program, but it was also pointed out that students cannot afford to pay for an extra year in college. Some participants questioned the advisability

of a five-year plan on the basis of the fact that the four-year program is not achieving what is should; therefore, why extend to a five-year program? It was pointed out, however, that there are federal funds for five-year programs, if Freshmen are identified as five-year students when they are admitted.

5. There was general agreement among the participants that secondary school counselors tend to advise students not to take mathematics courses in order to prevent failures. Similarly, some parents also do not want the students to take mathematics in order that their grade point averages are not affected adversely. The solution suggested was more communication and interchange between educators, counselors, and parents.
6. Remediation was suggested as a viable alternative for addressing the problem of mathematical inadequacy. These programs include peer tutoring, computer assisted instruction (CAI) using monitors or tutors with the computer, and the scheduling of mathematics laboratory sections, as in the other sciences.
7. It was noted that in some high schools students are permitted to take course options, in lieu of mathematics only if they have advanced to their proper grade level in the "basics."
8. It was recommended that a statistical survey needs to be conducted at the secondary level in order to obtain information on the courses taken by minority students. In addition, college Freshmen should be asked to list

the courses taken. These data should be shared with boards of education in order to apprise them of the situations in their schools.

9. There was a recommendation that, beginning in the 6th and 7th grades, students should be exposed to the advantages of successfully studying mathematics. Options should be curtailed and films and other media materials should be used to interest and motivate both students and parents on the advantages of proficiency in mathematics. Such materials could be disseminated through the NAACP, churches, fraternal organizations, and other community organizations.
10. It was recommended that every effort be made to influence educational associations, counselors, principals, and superintendents to restrict course options in lieu of mathematics in the secondary schools.
11. It was agreed that only persons trained in mathematics should be assigned to teach mathematics in elementary schools.
12. It was recommended that data be compiled on counseling and advising of the types of mathematics taken in elementary and secondary schools. In addition, data should be compiled on the preparation of the persons who teach mathematics. Such information should be disseminated to elected officials in an attempt to produce some political pressure for change.
13. It was the consensus that attempts should be made to convince mathematics teachers that they play a vital role

in influencing students by what they say and do. Therefore, they should provide good instruction as well as assist students in pursuing educational opportunities via the completion and submission of scholarship, financial aid, and other applications.

14. It was recommended that mathematics programs be designed to motivate students, ensure that they are proficient in the "basics," and provide a well-rounded program of training.

15. The recommendation was made that faculty members from the minority institutions should write textbooks and other instructional materials which address the problems that have been identified, while simultaneously attempting to have students achieve proficiency standards that are in line with national expectations.

ACTION TAKEN

A Mathematics/Computer Science Task Force of persons in each of the six states representing the region was established to write a proposal to be submitted to the National Science Foundation requesting funds to assist the Mathematics/Computer Science Group in collecting and analyzing data on mathematics and computer science education in minority institutions in the region. State representatives will coordinate the collection of data in their respective states. Members of the task force are J. Sutton, H. Windham, R. White, J. Colem, M. J. Williams, R. Jentry, C. Harris, G. Humphrey, R. Treadway, D. Brekke, G. Viswanath, J. Lewis, and G. Simmons. John

Hamblen of the University of Missouri was proposed to serve as a resource person. Carolyn Harris is the coordinator of the task force.

IV. PHYSICS AND ENGINEERING

Problems and Concerns

1. What are the employment possibilities for holders of the B.S. degree in physics?
2. How productive are the minority engineering schools?
3. Is there a problem of convincing potential physics majors of the advantages of pursuing physics as a career?
4. Are majority and elitist institutions aggressively recruiting minority students who have traditionally attended black institutions?
5. Is there difficulty in procuring ample funds to mount adequate recruitment programs to produce an upswing in the number of physics majors at minority institutions.

Strategies and Approaches

1. It was agreed among the participants that many black and minority students, together with their counselors, are unaware of the career and employment possibilities for persons who have earned the B.S. degree in physics. Suggested solutions are better communications among faculty members and counselors and other educational personnel at all levels and much more effective recruitment programs.
2. It was generally agreed that black and minority engin-

eering schools are experiencing difficulty in producing reasonable numbers of engineers. Suggested solutions were along the same lines as those in the preceding item.

3. There was general agreement that, because of the diversity of career options for persons majoring in physics, it is difficult to get secondary school graduates and college entrants to appreciate the advantages of pursuing careers in the field of physics. Suggested solutions for this problem are the same as those suggested for items 1 and 2 above.
4. It was agreed among the participants that majority and elitist institutions are aggressively recruiting the scant number of potentially good physics majors who have traditionally attended black and minority institutions. Suggested solutions are to counter these recruitment efforts with better communications among all concerned and with stronger and better recruitment programs, notwithstanding the fact that it is very difficult to compete against the eminently superior financial assistance programs offered by these institutions.
5. The participants were in agreement that it is extremely difficult to procure sufficient funds to mount adequate recruitment programs to produce a significant increase in the number of physics and engineering majors in the minority institutions. Suggested solutions were to appeal to the administrators of the institutions and interest from business, and to the private sector

for funds.

6. It was agreed that attempts should be made to ascertain why black and minority engineering schools are floundering prior to the establishment of new ones. It was suggested that many institutions might choose to effect a dual-degree arrangement as a more viable and less cost-prohibitive alternative.
7. It was suggested that the types of employment opportunities for holders of the B.S. degree in physics and engineers be identified; this should include the local and federal governments as well as private interests.
8. The suggestion was made that talented students within an institution should be sought out as potential majors in physics and engineering. Physical science as a service course affords a good opportunity for such recruitment.
9. It was recommended that secondary school students and entering Freshmen be encouraged to consider physics and engineering as a vehicle for gaining access to specializations in professional programs such as law and medicine.
10. The recommendation was made that modern-day advertising and promotional methods be utilized to recruit potential majors into the fields of physics and engineering.
11. It was recommended that recruiters for minority institutions point out to pre-college students the fact that majority and elitist institutions are not graduating the number of minority students that is

commensurate with the number that is admitted to their programs each year. These institutions are guilty of perpetuating a "revolving door" effect.

12. It was recommended that institutional administrators be urged to provide more funds for the support of faculty members in their recruitment efforts. Additionally, they should be urged to provide more funds as well as provide more time in order for the faculties to generate more majors in physics and engineering.

STRATEGY GROUP SESSIONS

Composite Report from Groups A, B, and C on the Broader Issues in Minority Science Education

TOPIC I. Interdisciplinary and Cognate Courses

Problems and Concerns

1. How does one discipline interface with other disciplines to provide training which will satisfy broader needs?
2. What should disciplines impart to students relative to careers and objectives?
3. How interdisciplinary should courses be in a specific major?
    a. What is the best possible curriculum for achievement of these goals?
4. How much intercommunication should there be between the disciplines?
5. Are interdisciplinary courses needed in all curricula?
6. Do the interdisciplinary courses enrich the overall appreciation of students' special areas and provide a sound basis for future studies?
7. Would prerequisites and requirements for an interdisciplinary degree impose an extra burden on students?

Strategies and Approaches

1. Make sure that faculty members have the requisite training and background for conducting interdisciplinary courses.
2. Insist on syllabi and course outlines that are ade-

quate for the objectives of the course.

3. Choose a coordinator for interdisciplinary courses who has the ability to get the faculty members to work as a unit.
4. The evaluation of interdisciplinary courses should be in terms of their impact on the curriculum as well as their benefits, as opposed to traditional courses.
5. The addition of interdisciplinary courses should be made with respect to:
   a. Future trends in science.
   b. Availability of funds for planning and implementing such courses.
   c. Job market and the standards required of graduates in the natural sciences and engineering.
4. The curriculum should have separate laboratory courses with interdisciplinary experiments, i.e., the laboratory courses should not be designed for any particular or specific course, but inclusive and apart from each of the major courses.

   Some opposition was expressed to this statement. Some people in the group felt that the traditional approach is better, e.g., teach a student a specific subject with the accompanying laboratory and let research provide the interdisciplinary experience.

5. If an interdisciplinary science degree is offered by an institution, it should be a rigorous degree with concentrations in at least three major areas.

   Again, no general or unanimous agreement was reached on this topic. Successes and failures were cited by faculty persons from Oakwood College and Johnson C. Smith University. Faculty persons

from Albany State and Kentucky State expressed reservations due to the requirements and restrictions which their respective state educational boards set for the core curriculum.

7. Society and societal needs should dictate the nature of a functional interdisciplinary degree.
8. Institutions should promote greater interaction between the scientific disciplines and the other academic disciplines in order to foster greater flexibility in students' course selection across departmental lines.
9. All science majors, including engineers, should have common core requirements to include:

1 year of biology)	
1 year of calculus)	
1 year of chemistry)	Nontraditional
1 year of physics)	

10. Courses, such as environmental studies, ecology, meteorology and oceanography, should be considered as capstone-type integrating courses, because of the interdisciplinary nature of their content.
11. Design interdisciplinary studies with career options in mind.
12. Use the team-teaching approach with faculty members from different disciplines.

TOPIC II. Academic Management

Problems and Concerns

1. How are programs planned to ensure maximal efficiency of operation?
2. How are programs planned to ensure maximal

cost-effectiveness?

Strategies and Approaches

1. Many of the institutional representatives reported that this is a part of the Planning, Management, and Evaluation Program which has been instituted at their respective institutions as a part of the Basic and Advanced Institutional Development Programs (BIDP and AIDP).
2. The establishment of better communications between all offices and/or units concerned.
3. The utilization of the principles of management-by-objectives:

   e.g. Set objectives
   Timeline objectives
   Meet objectives

4. Offer low enrollment courses in alternate semesters and/or years.
5. Establish data banks on students, course enrollments, schedules, and related information for management purposes.

TOPIC III. Recruitment and Retention

Problems and Concerns

1. What techniques can be used to recruit talented interested students to the minority institutions?
2. What steps must be taken to ensure that a recruitment program is effective?
3. Who are some of the persons whom recruiters should contact?
4. In addition to interest, what other student achieve-

ments, skills, and potential should recruiters take into consideration when recruiting prospective science majors?

5. What are some of the means of coping with the problems related to declining enrollments, in general, and in the sciences, in particular?
6. What are some of the activities which are recommended for enhancing recruitment programs?
7. How do small institutions overcome the problem of the inadequacy of funds for their recruitment programs?
8. What should the itinerary of the recruiters be?
9. What kinds of materials are available for recruiters?
10. What kinds of interchanges should recruiters have with students who are being recruited?
11. How can the recruitment effort be expanded without prohibitive costs?
12. What are some of the sources of information for the recruitment program?
13. Are there possibilities for the subsidization of recruitment programs?
14. How should minority institutions counter the vigorous recruitment of talented black students by majority institutions?
15. What can be done to reduce the tremendous amount of attrition?
16. How successful are tutoring programs in addressing the problems of retention?

a. Can students participate without stigmatization?

17. How can the curriculum be expanded and the number of courses be increased as an inducement to the recruitment program?
18. How and to whom should curricular information be filtered down into the grade school levels?

Strategies and Approaches

1. Institutions should develop programs which bring parents, students, faculty, and counselors from the schools to the campus.
2. Small colleges should effect joint recruitment endeavors as a means of reducing costs.
3. Black parents and students must be convinced that black institutions are able to produce. This can be achieved through community and civic organizations, such as churches and clubs.
4. Put recruitment components in proposals for funds--if the guidelines permit.
5. Utilize successful alumni in recruitment programs by having them serve as role models and interviewers; arrange to have prospective students visit them on the job and in their offices (where possible).
6. Develop and institute more summer and weekend science programs for pre-college students and teachers, e.g. high ability students, research, middle school, elementary, problem-solving, basic skills, "Math Fairs," and other kinds of programs.

7. Visit the schools and talk directly to students rather than depend on counselors and teachers.
8. Take college students on recruitment visits to schools; take graduates of the schools, if possible.
9. Conduct conferences, institutes, and other programs for counselors in order to acquaint them with science curricula as well as dispel and allay their fears relative to the difficulty of quantitative and/or mathematical studies in order that they will not continue to counsel minority students out of such programs.
10. Successful recruitment requires contacts with personnel at all levels, including management, e.g., state, local, community, and system.
11. Recruitment personnel need to continue to impress upon counselors, teachers, and prospective students the importance of the basic skills, particularly communicative and computational, for success in the sciences.
12. Institutions should develop and submit more proposals which provide financial aid to students as laboratory and research assistants; a special effort should be made to procure more funds for this purpose from the private sector.
13. The two-year colleges offer an excellent source for the recruitment of students, especially in the urban areas; four-year institutions should attempt to effect

working arrangements with these institutions locally to ensure curricular compatibility.

14. Institutions should maintain follow-up contacts with their graduates in order to develop recruitment materials on them as well as utilize them in the recruitment process.
15. Institutions should communicate more with local, regional, and national school systems in order to keep them fully apprised of their newer developments and offerings.
16. Faculty members in the science disciplines should work with their colleagues in redirecting students who are already enrolled in the science curricula.
17. Chairs and their science faculties should get to know teachers in the secondary schools and become familiar with the courses taught, textbooks used, and funds available. Thus, continuity between secondary and college courses could be enhanced; college instructors could also assist in the development of secondary school courses.
18. Small colleges could form consortia and develop specialties in order to compete with the larger institutions; industry and business could be included in such consortia.
19. Institutions should explore the possibility of providing financial aid on a sliding scale, e.g., the greater amount of support during the freshman year and

the least amount during the senior year.

20. Recruitment pools could be greatly expanded by the utilization of national surveys, such as the one provided by the American College Testing Service (ACTS).
21. A relatively large number of minority students with good potential and who live in the larger urban areas of the country is not heavily recruited; therefore, this is a pool that is largely untapped.
22. Institutions should attempt to effect cooperative arrangements with industries which will subsidize students in exchange for training in special areas; these could be consortial arrangements.
23. Job availability is very important both for choosing a career and recruitment, e.g., one participant reported considerable success by using the classified ads in the employment section of a local newspaper.
24. Recruiters should fully understand and be able to explain the financial aid packages that are available.
25. The Resource Center for Science and Engineering should compile a package outlining programs which have been funded at black schools and disseminate this information to all schools. In this way, programs which have proven to be successful in drawing students to science on one campus can be tried on other campuses.
26. A mechanism should be developed for tracking black students who are selected and enrolled in majority institutions on the basis of their high potential, but

who often become dropouts and are never heard from again. These students could be counseled according to their needs and possibly the brain drain could be reduced.

27. Efforts should be made to modify the current approaches and methods to remedial work in order to eliminate the use of tutors which, because of the stigma, tends to disaffect students.
28. Colleges should employ at least one full-time person for recruiting.

TOPIC IV. Careers

Problems and Concerns

1. How can a larger pool of students who have good potential for becoming scientists be identified?
2. How can the number of students who are interested in the sciences be increased?
3. How can minorities be encouraged to pursue careers in the fields of science in which there is an underrepresentation of minority persons, e.g., oceanography, meteorology, geology, etc., and particularly the earth sciences?
4. What kinds of materials are available for use in attracting students to careers in the sciences?
5. What are some of the newer and more innovative programs which provide students with more career options?
6. How can job availability be used in attracting students to careers in the sciences?

7. What is the importance of and how can role models be utilized in attracting students to careers in science?
8. How can the media be used in attracting young people to the sciences?

Strategies and Approaches

1. Faculty members can accompany and/or serve as recruiters to the secondary schools and identify students who have expressed an interest in science.
2. There is a continuing need to apprise prospective students, especially the small percentage of minorities, of the various career options in the sciences, particularly the earth sciences.
3. The development of programs which send out lecturers to serve as role models of successful people in science, e.g. Blacks and Mathematics (BAM) sends out lecturers who make presentations to 8th-grade students.
4. Work actively to get school boards to upgrade the requirements.
5. Become involved in the schools as parents and citizens, e.g., help select textbooks, plan programs, and provide input on new facilities or upgrading of old ones.
6. Improve science instruction in the elementary and secondary schools by having an impact on the teacher-training programs.
7. Seek support from the private sector to subsidize students who major in disciplines in which there is an underrepresentation of minority students, e.g. oil companies will support physics majors if they will

minor in geology.

8. Invite representatives of agencies and organizations which have an underrepresentation of minorities to the campus for the recruitment of students into these fields, e.g., the National Oceanographic and Atmospheric Administration.
9. Packets of materials on careers in the sciences should be put together and disseminated to schools and prospective students. Particular emphasis should be placed on the fields in which there is an underrepresentation of minorities.
10. Institutions must continue to change and upgrade their programs in order to enable their graduates to take advantage of the new and expanding career options.
11. Utilization of the job availability lists is an excellent means of creating career interest. One participant reported having had excellent success with the local newspapers.
11. Extensive use of the media is also an excellent means of acquainting students and teachers with careers in the sciences.
12. Institutions should establish dual degree programs, comparable to those already established in engineering,, in fields such as the earth sciences, oceanography, etc.
13. Institutions should seek to establish more cooperative education programs with private industry, local and federal governments.

TOPIC V. Research

Problems and Concerns

1. Does an undergraduate institution have a responsibility of providing an opportunity for some of its faculty members to engage in basic research activities?
2. How should students be used in research projects?
3. Should honor students be required to engage in research and/or other independent endeavors?
4. What is a good procedure for reporting on released time as required by many agencies?
5. What are some of the sources of support for research?
6. What equipment, facilities, and resources, other than those of the home institutions, are available?
7. What kind of testing program is needed to enable institutions to monitor their programs in terms of national standards?
8. What levels of administration must be involved in order to ensure a more effective research program?
9. What are some of the released time arrangements that have proven to be most successful?
10. How long can institutional researchers reasonably expect to procure funding from targeted or minority programs?
11. What are some of the means available to faculty members to increase their research capabilities in order to become competitive in the mainstream?
12. What can be done to get agencies and organizations

that have not funded programs at minority institutions to begin to do so?

13. How can equipment sharing programs be increased?
14. How can information on the research capability at minority institutions be disseminated?

Strategies and Approaches

1. Undergraduate institutions should have at least some of their instructional faculty members carry on some basic research activities. These activities could be greatly facilitated by released time arrangements in funded programs. Basic research activities must be viewed as an integral part of the instructional program.
2. Students should be involved in research projects as active participants rather than as "pairs of hands." Furthermore, they should be involved in the planning aspects as well as the writing of the proposals. All such involvement provides valuable learning experiences for the students. Graduate students, when available, should be used as co-investigators and should be co-authors, also.
3. Where possible, honor students should be encouraged to develop and conduct research and other independent projects. This encourages creativity on the part of students. Some participants reported varying degrees of success with seminar courses which had built-in research components. Not every student should be placed in such projects; only those who

can benefit should be chosen.

4. In all cases, released time should be in line with the arrangements set forth in a funded proposal. If a replacement is utilized, that person should be comparable in competence to the person replaced.
5. It is of the utmost importance that a system be developed to ensure that the time allotted in a released time arrangement is actually spent as stipulated in the conditions and understandings set forth in the grant.
6. There are various sources of facilities, equipment, and resources other than those located at one's home institution. Among these would be the national laboratories, such as the Argonne, Lawrence Livermore, Brookhaven, Oak Ridge, and various others. On a regional basis, the Southern Regional Education Board provides a list of institutions which participate in the "Common Market" Program. These institutions make available their facilities and equipment, much of which is one of a kind.
7. A good testing program is needed in minority institutions in order to ensure that the proficiencies of students, particularly in the basics, are such that valid comparisons can be made with national achievement standards.
8. In planning research programs, input and participation should be provided at all levels--from the Office of the President down to and including the students.

9. If possible, or at all feasible, skilled technicians should be included in research projects.
10. Some institutions have found that the "Multiple fractional replacement released time arrangement" is useful in implementing research programs, e.g. one-third released time for three persons can be replaced by one person working full time.
11. Faculty members need to continue to develop their research capabilities so that they do not have to rely on targeted or minority programs for funding. Rather, they will be able to obtain funds competitively on a national scale.
12. Faculty members should participate in summer research institutes and other activities in order to gain the requisite expertise for conducting research projects, e.g., NASA, CDC, Lawrence Livermore, etc.
13. Faculty members should explore the possibilities of procuring Research Career Development Awards. They pay an individual's salary for up to five years. Thus, a faculty person is free to seek support for and conduct research projects.
14. One means that was identified for countering the recruitment efforts of the majority institutions is the utilization of equipment sharing, personnel exchanges, and related programs. Bowie State College reported such an agreement with the Pawtucket Water Research Center (PWRC). This agreement included the following:

a. an internship program
b. lectures by personnel from PWRC
c. utilization of PWRC personnel as consultants at no cost
d. utilization of PWRC as a field experience for students

15. The RCSE should invite personnel from agencies and organizations which have not been very active in funding minority institutions to its conferences and other activities in order that they will learn of the research capabilities at these institutions, e.g., the Department of Defense, etc.

16. The RCSE should put together a packet of materials which describe the research capabilities of each of the participating institutions of the Regional Institutions Component and send one to the secretary of each cabinet and other appropriate personnel in their respective cabinets.

TOPIC VI. Resources and Funding

Problems and Concerns

1. What is the current status of federal funding, particularly for targeted and minority programs?
2. Are funds for training adequate?
3. What causes cutbacks in indirect costs?
4. Is the pool of college students declining and what, if any, are the implications?
5. What will be the consequences of the Presidential Memorandum of January 17, 1979, concerning black institutions?

6. What will be the criteria for subsequent funding?
7. Are there basic operational differences between grants and contracts?
8. What are the implications for the black institutions relative to the reduction in staff in Region IV Office of HEW?
9. How can representatives from black institutions enhance their changes of achieving success in grantsmanship?
10. How can more scholarships, fellowships, and traineeships be procured?
11. What are some of the more glaring weaknesses reported by the reviewers of proposals?
12. What are some of the key items required for increased grantsmanship?

Strategies and Approaches

1. The statements which follow were made to the participants by Dr. John T. Hayes prior to the beginning of the discussion on strategies and approaches, in order to give them some idea of the trends in the federal agencies.

   a. there is a cutback in funding
   b. there is an undersupply of training funds
   c. the amounts allowed for indirect costs were cut back because it was felt that abuses had been taking place
   d. according to the demographers, the pool of college students is decreasing, hence, funding is based on the majority and not the minority (as one would expect)
   e. President Carter's Memorandum of January 17, 1979 concerning black institutions should be helpful
   f. Time, effort, and accountability are very important considerations in the awarding of grants

g. when grants are compared with contracts, it is found that grants are loosely structured and contracts are restricted; sometimes the latter are too restrictive, especially for investigators, because they stifle creativity
h. the Region IV Office of HEW has a reduced staff, but the personnel is willing to help the black institutions
i. political clout is helpful in getting things done; however, it is suggested that letters and other forms of contact be initiated with Senators and Representatives rather than with the federal agencies, because politics are neither possible with nor condoned by the agencies

2. It was pointed out that most of the proposals submitted could be strengthened and grantsmanship enhanced by the following:

   a. improved long-range planning
   b. better plans for monitoring and measuring progress programmatically
   c. better management and accounting procedures for funds

3. In addition to the sources of federal funds which were indicated, it was pointed out that there are other funds available, such as:

   American Chemical Society--Petroleum Research Fund

   Type B - research for undergraduate institutions
   Type AC - graduate research

4. Minority institutions must continue to develop their grantsmanship in order to be able to compete for funds in the mainstream.
5. Institutions should make long-range plans and seek funds in which the grant periods of awards overlap.
6. RCSE should provide a cadre of knowledgeable persons to define clearly the guidelines of funding programs.
7. RCSE should provide professional rewriters and/or

consultants so that the content of proposals will be written clearly.

3. RCSE should make available contact persons who can outline, initiate, and follow through the proposal submission process.
4. RCSE should acquire the services of and make available to the institutions a Grants Management Officer. Each institution should develop either a Grants Management Office or a Grants Management component of its Business Affairs Office.
5. RCSE should provide information on funding sources and act as a clearinghouse on funded proposals. Such information could be disseminated in a newsletter, which could also contain information on likely sources of funds.
6. RCSE should provide a consulting service for institutions who have written unsuccessful proposals. Consultants could criticize these proposals and make recommendations for their resubmission.

CONCLUDING REMARKS

Shirley M. McBay
Program Director
Minority Institutions Science
Improvement Program
National Science Foundation

I would like to begin by offering my congratulations to Drs. Cole and Brown and other members of the Resource Center staff for putting together this first conference on issues in minority science education and to thank each of you for your attendance here. I hope that you have used this opportunity to exchange your views and ideas regarding the various issues that have been identified with others in attendance at the conference, and that you will share the information and ideas obtained with your science faculty colleagues when you return to your home institutions.

Many federal programs, including National Science Foundation programs, have been discussed at the conference. If you are considering applying for assistance to one of these programs, I hope you will be certain that the objectives of the federal program fit those of your institution and your department, and that you will apply for assistance to those programs where there is a match in objectives.

In the event that your proposal is not successful the first time, you should be certain to request staff and verbatim reviewer comments on your proposal. After

reviewing these comments, you may wish to consider re-applying to the specific program with a new proposal which addresses adequately the major weaknesses identified in the staff and reviewer comments. I would like to call your attention to the paper on common weaknesses observed in nonfunded proposals submitted to the Minority Institutions Science Improvement Program which was contained in your registration packets.

Again, may I extend my congratulations to the Resource Center staff for this very fine effort.

ROSTER OF PARTICIPANTS

Name	Institution	Disc.
1. AGRURUAL, Jadish	Atlanta Jr. College	Phys.
2. AGUMADU, Christopher	St. Augustine's College	Math.
3. ALEXANDER, Windser	N. Carolina A&T State Univ.	Eng.
4. ARCHER, Vernon	Jackson State University	Bio.
5. ATKINSON, Wilveria	Winston-Salem State Univ.	Bio.
6. BACON, Arthur	Talladega College	Bio.
7. BAJWA, Jaswant	Edward Waters College	Chem.
8. BAKER, Paul	Livingstone College	Math.
9. BARBER, William	Johnson C. Smith Univ.	Bio.
10. BARRETT, Roy	Fayetteville State Univ.	Bio.
11. BENDER Judith	Morehouse College	Bio.
12. BENSON, Ernest	Albany State College	Bio.
13. BETTAIYA, Rajanna	Selma University	Bio.
14. BLACK, Billy	Albany State College	Chem.
15. BLAKE, John	Oakwood College	Math.
16. BOTA, Kofi	Atlanta University	Chem.
17. BOZEMAN, Robert	Morehouse College	Math.
*18. BRANSON, Herman L.	Lincoln University	Phys.
19. BREKKE, Dale	Benedict College	Math.
20. BROWN, George	Kentucky State Univ.	Bio.
21. BROWNE, John	Atlanta University	Bio.
22. CANTY, George, Jr.	Ft. Valley State College	Chem.
23. CARLISLE, Ronald	Atlanta Jr.College	Chem.

*Panelist

Name	Institution	Disc.
24. CHAPATWALA, Kirit	Selma University	Bio.
25. CHARLES-SHANNON, Velma	Livingstone College	Math.
26. CHINN, Ralph	Clark College	Psych.
27. CHU, Kwo-Sun	Talladega College	Phys.
28. CLARK, Carl	S. Carolina State College	Phys.
29. COLEN, Joseph	Jackson State Univ.	Math.
30. COLINET, Gide	Olive-Harvey College	Chem.
31. COOPER, Emerson	Oakwood College	Chem.
32. COTTRELL, Peter	Florida A&M Univ.	Chem.
33. CRYER, Clarence	Florida Memorial College	Educ.
*34. CUMMINGS, Frank	Atlanta University	Chem.
35. DeLAUDER, William	N. Carolina A&T State Univ.	Chem.
36. DIXON, Clinton H.	Ft. Valley State College	Bio.
37. EDWARDS, Kiah	Atlanta University	Bio.
38. ESPY, Calvin	Atlanta Univ. Center	Eng.
39. EVANS, Richard	Alabama A&M Univ.	Chem.
40. FALCONER, Etta	Spelman College	Math.
41. FINKELSTEIN, Isabella	Clark College	Bio.
42. FLUELLEN, Alexander	Clark College	Math.
43. FOSKEY, Henry	Elizabeth City State Univ.	Ind. Arts
*44. FOWLKS, Edison	Bishop College	Bio.
45. FRANKS, William	Langston University	
46. GEORGE, M. C.	Alabama A&M Univ.	Chem.
47. GILLYARD, Connie	Spelman College	Chem.
48. GILCHRIST, Jason	N. Carolina A&T State Univ.	Phys.
49. GLASS, Gladys	Spelman College	Math.

*Panelists

Name	Institution	Disc.
50. GOMEZ, Manuel	Univ. of Puerto Rico	
51. HAHN, Ingun	Benedict College	Phys./ Eng.
52. HALL, John	Clark College	Math.
53. HAMILTON, Frank	Atlanta University	Chem.
54. HARRIS, Carolyn	Clark College	Math.
55. HARRIS, Mary	Sickle Cell Foundation of Ga.	
56. HARRIS, Sid	Georgia State University	Eng.
*57. HAYES, John T.	Paine College	Bio.
*58. HENDERSON, James	Tuskegee Institute	Bio.
59. HILL, Johnny	Bowie State College	Admin.
60. HUBERT, Charles	Clark College	Bio.
61. HUMPHREY, Gwendolyn	Florida A&M University	Math.
62. HUNTER, Roy, Jr.	Atlanta University	Bio.
63. ISABEL, Roy	S. Carolina State College	Chem.
64. JACKSON, William	Howard University	Chem.
*65. JAY, James M.	Wayne State University	Bio.
66. JOHNSON, Joe	Atlanta Univ. Center	Chem.
67. JONES, Charles	Miles College	Bio.
68. JONES, Edward	Oakwood College	Bio.
69. JONES, Rena	Spelman College	Bio.
70. JONES, Wendell	N. Carolina A&T State Univ.	Math.
71. KIM, Kinney	N. Carolina Central Univ.	Phys.
72. KINNARD, James	Benedict College	Chem.
73. KOTHARI, Indulal	Tuskegee Institute	Phys.
74. LOCKHART, Verdree	Georgia Dept. of Education	
75. LOWE, Rose	Spelman College	Math.

*Panelists

Name	Institution	Disc.
76. LUMB, Judith	Atlanta University	Bio.
77. MASIH, Samuel	Albany State College	Math.
78. MAYFIELD, John E.	Atlanta University	Bio.
79. McBAY, Henry C.	Morehouse College	Chem.
80. McBAY, Shirley	National Science Foundation	
81. McCOY, George	Benedict College	Bio.
82. McLEOD, J. I.	Morris Brown College	Chem.
83. MICHAEL, Leroy	Savannah State College	Math/ Comp. Sci.
84. MICKENS, Ronald	Atlanta University	Phys.
85. MILLER, Carolyn	Woods Hole Oceanographic Institute	
86. MILLER, Herman	Lincoln University	Phys.
87. MILLER-STEVENS, Louise	Spelman College	Bio.
88. MITCHELL, J. C.	S. D. Bishop State Jr.College	
89. MITCHELL, Robert	Jackson State Univ.	Phys.
90. MITCHELL, William	N. Carolina A&T State Univ.	Bio.
91. MOORE, Wilbur D.	Atlanta University	Bio.
92. MOOREHEAD, W. D.	Ft. Valley State College	Bio.
93. MOSKOVICK, Arlene	Central State University	Math.
94. MUNAVALLI, Shakhar	Livingstone College	Chem.
95. ODOM, Rosaline	Clark College	Chem.
96. ODOM, Thomas	Grambling State College	Phys.
*97. OLIVAS, Michael	Howard University	Edu.
98. OSUIJI, Felix	Rust College	Bio.
99. PENN, James	Morris Brown College	Bio.
100. PERKINS, James	Jackson State University	Chem.

*Panelist

Name	Institution	Disc.
101. PERUMAL, Appavoo	Johnson C. Smith Univ.	Phys.
102. PURI, O. P.	Clark College	Phys.
103. RAO, Narsing	Bethune-Cookman College	Phys.
104. RAO, Sekhara	Bennett College	Bio.
105. RAPHAEL, Louise	Clark College	Math.
106. RAY, Isadore	Voorhees College	Math.
107. REED, James	Atlanta University	Chem.
108. RICHARDSON, Thomas	Bethune-Cookman College	Chem.
109. RICHARSON, David	Kentucky State University	
110. RILEY, Joseph	Bronx Community College	Chem.
111. RINEHART, Frank	College of Virgin Islands	Chem.
112. ROBINSON, Margaret	Savannah State College	Bio.
113. ROBINSON, Walter	Atlanta Council of Black Professional Engineers	
114. RODGERS, Ralph	Dillard University	
115. ROWE-ANDERSON, Huey	Johnson C. Smith Univ.	Chem.
116. SAHA, Krishikesh	Alabama A&M University	Comp. Sci.
117. SALTERS, Walter	S. Carolina State College	Bio.
118. SAYLES, J. Henry	Bennett College	Chem.
119. SEKHARAN, Karuthethil	Selma University	Phys./ Math.
120. SEN, Shukdeb	Bethune-Cookman College	Bio.
121. SHARMA, Deva	Livingstone College	Math.
122. SHEEHY, Ronald	Morehouse College	Bio.
123. SHETTY, Antaraguptu	Florida A&M University	Bio.
124. SHIPMAN, James T.	Clark College	Phys.

Name	Institution	Disc.
125. SHIPMAN, Jerry	Alabama A&M University	Math.
126. SIMMONS, Grover C.	Atlanta Univ.Center	Comp. Sci.
127. SINGH, Ragbir	Benedict College	Bio.
128. SINHA, O. P.	Clark College	Phys.
129. SMITH, Courtney	Tuskegee Institute	Chem.
130. SPRIGGS, Alfred	Clark College	Chem.
131. STEVENSON, Enola	Atlanta University	Bio.
132. STINSON, Charles	Talladega College	Chem.
133. SUTTON, James	Miles College	Math.
134, SWAMI, M. M.	Claflin College	Math.
135. TAYLOR, Ann	Bethune-Cookman College	Math.
136. TOWNES, James	Elizabeth City State Univ.	Chem.
137. TOWNES, Theodore	Fisk University	Chem.
138. TREADWAY, Ray	Bennett College	Math.
139. TUCKER, William P.	Florida A&M University	Phys.
140. TUNSTALL, Lucille	Clark College	Bio.
141. TURNAGE, Curtis	Elizabeth City State Univ.	Bio.
142. VAISHNAV, Dinesh	Selma University	Bio.
143. VISWANATH, G. R.	S. Carolina State College	Math/ Comp. Sci.
144. WATKINS, N. L.	Bennett College	Comp. Sci.
145. WHITE, Richie	Ft. Valley State College	Math.
146. WILLIAMS, George N.	Savannah State College	Chem.
147. WILLIAMS, Mary J.	Winston-Salem State Univ.	Math.
148. WINDHAM, Herman	Tuskegee Institute	Math/ Comp. Sci.

Name	Institution	Disc.
149. WRIGHT, Hampton	Johnson C. Smith Univ.	Math/ Comp. Sci.
150. YOUNG, Alfred	Atlanta University	Chem.

OTHERS:

Resource Center for Science and Engineering

Dr. Thomas W. Cole, Jr. Project Director

Dr. Paul L. Brown, Assistant Director for Regional Institution Component

Dr. Melvin R. Webb, Assistant Director for the Community Outreach Component

Atlanta University

Gwendolyn Rutledge	Student/Chemistry
Charles Strickland	Student/Chemistry
Ramona Calvey	Student/Chemistry
Leon Henry	Audiovisual Technician
Alvin Strickland	Audiovisual Assistant
Norris Curtis	Audiovisual Assistant

SUMMARY

Discipline	Number	Percentage
Biology	44	29.33
Chemistry	35	23.33
Mathematics	30	20.00
Physics	21	14.00
Engineering	3	2.00
Computer Science	3	2.00
Education	2	1.33
Psychology	1	0.67
Industrial Arts	1	0.67
Others	10	6.67
Total	150	100.00

APPENDIX

EVALUATION SHEET

Indicate your rating of the overall effectiveness of the items listed below toward attaining the objectives of the Conference by encircling a number after the item.

	E	G	A	F	P*
1. The overall convention facilities (hotel rooms, session rooms, etc.)	5	4	3	2	1
2. Pre-convention publicity was sufficient	5	4	3	2	1
3. General sessions, concurrent sessions, and other convention activities were sufficiently delineated in the program	5	4	3	2	1
4. The sequence of this conference was wisely arranged	5	4	3	2	1
5. Registration for this conference was easy to complete	5	4	3	2	1
6. Choice of panelists	5	4	3	2	1
7. Presentation of the panelists	5	4	3	2	1
8. Questions and answer period (panel)	5	4	3	2	1
9. Guest speaker	5	4	3	2	1
10. Strategy Group Sessions					
A. Interdisciplinary-Cognate & Management	5	4	3	2	1
B. Recruitment, Enrollment, Careers	5	4	3	2	1
C. Funding and Research	5	4	3	2	1
11. Discipline Group Sessions					
Encircle a number for your group only					
A. Biology	5	4	3	2	1
B. Chemistry	5	4	3	2	1
C. Mathematics-Computer Science	5	4	3	2	1
D. Physics-Engineering	5	4	3	2	1
12. Summary Group Session	5	4	3	2	1
13. Choice of topics for discussion	5	4	3	2	1
14. Overall rating for the conference	5	4	3	2	1

IF ADDITIONAL SPACE IS NEEDED FOR THE FOLLOWING QUESTIONS, PLEASE USE REVERSE SIDE OF THIS SHEET.

15. Was there anything that should have been added,

deleted, and/or changed? Yes ___ No ___

If yes, WHAT? WHY?

16. What recommendations do you have for future conferences?

17. Make any additional reccmmendations which you deem pertinent.

*E - Excellent
G - Good
A - Average
F - Fair
P - Poor

PERCENTAGE OF RESPONSES TO CONFERENCE EVALUATION QUESTIONNAIRE*

	Excellent	Good	Average	Fair	Poor
1.	29.00	40.10	21.90	9.00	-
2	26.92	48.08	17.31	5.77	1.92
3.	32.69	50.00	13.46	3.85	-
4.	38.46	42.31	15.38	3.85	-
5.	65.38	27.92	3.85	2.85	-
6.	44.23	42.31	9.62	3.85	-
7.	26.00	63.46	10.54	-	-
8.	19.23	34.61	36.54	-	3.85
9.	75.00	17.31	5.77	-	-
10.A	11.54	25.00	48.08	15.38	-
B	50.00	26.93	15.38	7.69	-
C	38.46	44.23	15.38	1.53	-
11.Biology (% based on 20 responses)					
	15.00	50.00	20.00	15.00	-
Chemistry (% based on 15 responses)					
	20.00	60.00	13.33	6.67	-
Math/Comp.Sci. (% based on 16 responses)					
	18.75	37.50	31.25	12.50	-
Physics/Engineering (% based on 6 responses)					
	-	83.33	16.67	-	-
12.	19.23	55.77	15.38	9.62	-
13.	36.22	53.85	9.61	1.92	-
14.	30.77	59.62	7.69	1.92	-

*Percentage is based on the 44.28 percent of all conference participants responding.

15. In regard to the opening session:

    a. too many panelists

    b. no regard for presentation time; consequently, there was little time for questions/discussion.

    c. too many sessions on Friday afternoon--substitute one night session for an afternoon session.

16. Recommendations (listed if there were three or more responses):

    a. better reimbursement procedure

    b. proposal writing workshop

    c. notification of final acceptance and room confirmation

    d. more time for sessions--1½ hrs. rather than 1 hr.

    e. list of services provided by RCSE

    f. follow-up conference (75 percent favored this)

    g. maintain schedule

    h. data bank of recent black graduates and their employers

    i. soundproof meeting rooms

    j. participants to address, in writing, issues prior to conference

    k. representation from industries and government organizations presently funding minority institutions

    l. compilation by RCSE of granting agencies (i.e., DOD) not presently supporting minority institutions and their research

17. RECOMMENDATIONS:

    a. include a scientific writing course in all science majors' curricula

RACIAL/ETHNIC ENROLLMENTS, 1976

	WHITE	%	BLACK	%	HISPANIC	%	ASIAN	%	AMERICAN INDIAN	%	TOTAL MINORITY	%	NON-RESIDENT ALIEN	%	AGGREGATE
TOTAL UNDERGRADUATE															
Full-time	4,820,736	81.2	605,116	10.2	263,982	4.4	103,247	1.7	38,420	.6	1,010,765	17.0	104,421	1.8	5,935,902
Part-time	2,070,377	80.3	261,199	10.1	145,682	5.7	51,700	2.0	22,996	.9	481,577	18.7	25,454	1.0	2,577,408
Totals	6,891,093	80.8	866,315	10.2	409,664	5.1	154,997	1.9	51,315	.8	1,391,231	17.9	129,875	1.4	8,513,310
TWO-YEAR UNDERGRADUATE															
Full-time	1,280,872		221,874		119,444		33,908		18,424		393,650		16,253		1,690,775
Part-time	1,799,927		207,849		122,565		46,510		22,820		399,744		26,172		2,225,843
Totals	3,080,799		429,723		242,009		80,418		41,244		793,394		42,425		3,916,618
TWO-YEAR AS % of UNDER-GRADUATE CATEGORY	.44		.50		.59		.52		.67		.53		.33		.46
FULL-TIME AS % of UNDER-GRADUATE FULL-TIME	.26		.37		.45		.33		.48		.39		.16		.19

SOURCE: Unpublished data, Office for Civil Rights, National Center for Education Statistics, The Condition of Education, 1978 Edition, Table 3.6; Higher Education Daily, 6, No. 59 (March 1978):1-2. ISEP staff calculations.

(Read table, as follows: "Fifty percent of all undergraduate black students are in two-year colleges." "Forty-six percent of all undergraduate students are in two-year colleges.")